FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION – 2025
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT

Physics Paper-II

TIME ALLOWED: THREE HOURS	PART-I (MCQS)	MAXIMUM MARKS = 20
PART-I(MCQS): MAXIMUM 30 MINUTES	PART-II	MAXIMUM MARKS = 80

NOTE:

    (i) First attempted **Part-I (MCQS)** on the separate **OMR Answer Book** which shall be taken back after 30 minutes**.**

    (ii) Overwriting/cutting of the **options/answers** will not be given credit.

    (iii) There is no **negative marking**. All **MCQs** must be attempted.

PART-I (MCQs)(COMPULSORY)

Q.1.   **(i)** Select the best option/answer and fill in the appropriate Box on the **OMR Answer Sheet. (20x1=20)**
    (ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

1. A charge moving in a uniform static magnetic field experiences:
(A) A force perpendicular to magnetic field and velocity
(B) Increase in momentum
(C) Decrease in momentum
(D) Decrease in velocity

2. The same energy alpha particles and electrons associated De Broglie wavelengths are:
(A) Equal
(B) Longer than electrons
(C) Smaller than electrons
(D) None of these

3. The mass deficit defines:
(A) Nuclear binding energy
(B) Nuclear quadrupole moment
(C) Shape of the nucleus
(D) None of these

4. In nuclear physics, the magic number defines:
(A) Nuclear binding energy

(B) Relatively exceptionally stable nuclei
(C) Radioactivity
(D) None of these

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5. The Zeeman effect is due to the interaction of:
(A) External magnetic field and total magnetic field of the specimen
(B) External electric field and magnetic field of specimen
(C) L-S coupling
(D) None of these

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6. A photon having the same energy as an electron has wavelength _____ as electron's De Broglie wavelength.
(A) Shorter
(B) Longer
(C) Same
(D) None of these

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7. In Lorentz transformation, motion along _____ axis remains zero.
(A) One axis
(B) Two axes
(C) Three axes
(D) None of these

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8. Gauss's law is applicable on the charges which are:
(A) Closely distributed in space
(B) Sparsely distributed in space
(C) Enclosed by a broken surface
(D) Enclosed by a closed surface

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9. The ratio between angular momentum and orbital magnetic moment vector of the first orbital electron of a hydrogen atom is known as:
(A) Total Magnetic Moment
(B) Bohr Magneton
(C) Magnetic Moment
(D) None of these

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10. The cyclotron is a device primarily used to:
(A) Accelerate subatomic particles
(B) Generate electrons
(C) Generate neutrons
(D) Generate protons

11. The rate of change of current in a coil is proportional to:
(A) V
(B) -emf
(C) R
(D) None of these

12. The charging and discharging behavior of an ideal RLC circuit is:
(A) Simple harmonic
(B) Linear
(C) Elliptical
(D) Unpredictable

13. The Lorentz force is given by:
(A) $F = q (v \times B)$
(B) $\Phi = \partial A/\partial x + \partial A/\partial y + \partial A/\partial z$
(C) $F = q (va \times B)$
(D) None of these

14. The Poynting vector represents:
(A) The rate and direction of electromagnetic energy transferred in space
(B) The amount of electromagnetic energy transferred in different forms of energy
(C) Loss of electromagnetic energy in a medium
(D) The flow of thermal energy in a certain direction

15. The De Broglie wave-particle duality is said to be foundation of the uncertainty principle because:
(A) The velocities of the particles were very high
(B) The mass could not attain the velocity of light
(C) The mass increases at velocities comparable to the velocity of light
(D) The uncertainty in position of the moving mass

16. The relation between half-life and mean life is:
(A) Inversely proportional
(B) Directly proportional
(C) Equal
(D) Half

17. The concept of mutual frame of reference was used in:
(A) Reduced mass correction in spectroscopy
(B) Radioactivity

(C) Relative nuclear stability
(D) None of these

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18. The Ultraviolet catastrophe means:
(A) Spectral energy concentration towards longer wavelength
(B) Spectral energy concentration at the middle of the spectrum
(C) Spectral energy concentration towards shorter wavelength
(D) None of these

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19. As per quantum physics, the observables 'E' and _____ cannot be simultaneously measured with 100% accuracy:
(A) px
(B) t
(C) x
(D) None of these

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20. The theory of relativity predicts that at velocities comparable to the speed of light, the moving mass appears to:
(A) Increase
(B) Decrease
(C) Remain the same
(D) None of these

PART-II

Q.2. **(a)** Discuss the spectral properties of perfect black body radiation. Explain the ultra violet catastrophe. **(10)**

(b) Find the fifth & seventh member of Balmer spectral series. If the third member is 1200 Å. **(10) (20)**

Q.3. **(a)** In quantum mechanics explain the term commutation between the observables. **(10)**
(b) Explain how De Broglie wave particle duality laid down the fundamentals of uncertainty principle. **(10) (20)**

Q.4. **(a)** In the context of nuclear physics explain the magic numbers. **(10)**
(b) Explain nuclear quadrupole moment and explain its significance. **(10) (20)**

Q. 5. **(a)** Derive the expression for electric dipole moment. Discuss two uses in modern science, **(10)**
(b) Discuss Biot and Savart law and derive its expression, using suitable schematic figure. **(10) (20)**

Q. 6. **(a)** Explain how Hall's effect could be used to find the sign of charge carriers. **(10)**
(b) Explain the Hall's effect. How it could calculate the number of charge carriers in material. **(10) (20)**

Q. 7. **(a)** Explain the construction and working of photo multiplier tube (PMT). (10)
(b) Compare the energies of a proton and electron having same De Broglie wave length of 1Å. **(10) (20)**

Q. 8. Write short notes any TWO of the following: **(10 each) (20)**
   (a) Reduced mass correction in spectroscopy
   (b) Electron microscope
   (c) Heisenberg uncertainty principal